MULTIPLHY

MULTIMEGAWATT HIGH-TEMPERATURE ELECTROLYSER TO GENERATE GREEN HYDROGEN FOR PRODUCTION OF HIGH-QUALITY BIOFUELS

Project ID	875123
PRR 2024	Pillar 1 – Renewable hydrogen production
Call topic	FCH-02-2-2019: Multi megawatt high-temperature electrolyser for valorisation as energy vector in energy intensive industry
Project total costs	EUR 9 751 722.50
Clean H_2 JU max. contribution	EUR 6 993 725.39
Project period	1.1.2020–31.12.2024
Coordinator	Commissariat à l'énergie atomique et aux énergies alternatives, France
Beneficiaries	Engie, Engie Energie Services, Neste Engineering Solutions BV, Neste Engineering Solutions Oy, Neste Netherlands BV, Neste Oyj, Paul Wurth SA, Sunfire GmbH

https://multiplhy-project.eu

PROJECT AND GENERAL OBJECTIVES

Multiplhy will demonstrate the technological and industrial leadership of the EU in solid oxide electrolyser cell (SOEC) technology. With its rated electrical connection of ~ 3.5 MW, electrical rated nominal power of ~ 2.6 MW and a hydrogen production rate of ≥ 670 Nm^3/h. Multiplhy's electrical efficiency (85 %) will be at least 20 % higher than the efficiencies of low-temperature electrolysers, enabling the reduction of operational costs and the reduction of the connected load at the refinery and hence the impact on the local power grid.

Multiplhy aims to install and integrate the world's first high-temperature electrolyser (HTE) system on a multi-MW scale at a renewable product refinery located in Rotterdam, Netherlands, demonstrating both technological and industrial leadership of the EU in the application of SOEC technology. The central element of the project is the manufacturing and demonstration of a multi-MW HTE and its operation in a renewable product refinery. As a result, Multiplhy promotes the SOEC-based HTE from technology readiness level 7 to 8.

NON-QUANTITATIVE OBJECTIVES

The Multiplhy project aims to scale up technology to the multi-MW level by optimising efficiencies, increasing availability, improving operations and improving stack durability. The system was installed on-site in April 2023 and the target start-up date was August 2023. The designs of the HTE and hydrogen-processing unit focus on high efficiency, with the 12 modules passing the quality criterion of electrical consumption below 42 kWh/kg H_2. A service and maintenance concept has been defined, and real availability will be monitored during the operation phase.

The project has also reduced capital cost and operation and maintenance expenditure by developing a design-to-cost strategy and refining the cost analysis. Techno-economic evaluations have been performed, providing methodology and reference values for various scenarios, and determining the impact of electricity prices, efficiency and the capital expenditure total integration cost.

PROGRESS AND MAIN ACHIEVEMENTS

- The project demonstrated stack durability for more than 7 000 hours without H_2 production loss for small stacks.
- The testing of durability on large stacks (> 10 kW) is ongoing for two types of stack (electrolyte-supported cell and anode-supported cell) with no H_2 production loss.
- A new-generation HTE module was developed to decrease capital expenditure.
- Factory acceptance testing of all 12 modules was completed.
- The HTE and hydrogen-processing unit were installed on site.
- Cold commissioning was performed.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Target achieved?	SOA result achieved to date (by others)	Year for reported SOA result
Project's own objectives	Demonstration duration	hours	16 000	⚙	N/A	N/A
AWP 2019	Electrical consumption	kWh/kg	39.2		39.7	2017
	H_2 production loss at the stack level	%/1 000 h	1.2	✓	1.9	2017
	Downtime	%	2	⚙	N/A	N/A

Clean Hydrogen Partnership
Co-funded by the European Union